

THE INFLUENCE OF BROADBAND REGULATION IN EU ON THE DEVELOPMENT OF REGULATED TECHNOLOGY

Andrej Mihevc, Regulation consulter

Abstract: *The aim of the article is to answer the question if the level of intensity of “ex ante” regulation (also “regulation”) imposed by NRA (national regulatory Authority) influence on the development of incumbent DSL technology against other Access technologies. There are several approaches which support the basic idea of regulation, that “ex ante” regulation promotes the competition. The approaches must be also based on the size of the market. In the internet world there are different access technologies. Access is a crucial and a rare facility. Based on the approach of three criteria, European Commission defines two wholesale relevant access markets both based on DSL technology (“bitstream” access and unbundled local loop) susceptible to sector specific “ex ante” regulation. In the last stage also optical access is included in the unbundled local loop relevant market. Other technologies are still not equivalent to incumbent DSL technology according to the opinion of the commission. The intensity of regulation influences on the competition conditions. It influences on the level where and at which point of the investment ladder entrants will enter the market through wholesale inputs or through building its own infrastructure.*

Keywords : *regulation, market analyses, Broadband, correlation, DSL technology*

1. Introduction

Among the different platforms for broadband access it is possible to distinguish between wired, wireless and fixed wireless (Picot and Wernick 2007, 660-661). Wired access platforms include digital subscriber line (DSL)/ copper line, fibre optics, powerline and cable. Wireless platforms comprise 3 G cellular and satellite transmission, while fixed wireless encompasses WiFi and WiMax. The distinction between different technology platforms is important for several reasons. First of all, in many countries distinguishes between technology platforms. Cable and DSL networks, as well as other broadband platforms show different technological properties. Designed for broadcasting, all participants in a coaxial cable share the bandwidth, which leads to variations in the capacity available to the user. In comparison to cable, DSL based on copper telephone lines offers steady bandwidth due to the fact that each participant has his or her own connecting line. Countries with both DSL and cable infrastructure benefit significantly from infrastructure competition. There is an inverted u-relationship between cable market share and broadband penetration. The peak is at 50 % equal market shares of cable and DSL technology (Höfler 2005, 11). For Broadband Internet connectivity there are two major networks: telephone and cable. There are also alternative technologies to Broadband Access, such as wireless, power line, satellite and UMTS. However, these technologies are still at the development stage, although in the future they might compete with cable and DSL. From this information it is possible to conclude that DSL is still the dominant technology, beside the next generation access via optical fibers. Regulators have to evaluate their decisions in the light of whether they promote the rolling out of parallel, competing infrastructure (infrastructure competition) or whether they further competition in a single network with regulated Access (service competition). Experiences from telecommunications

deregulation and regulation show that up to now regulators have tried to establish frameworks enabling both forms of competition. Nevertheless, especially in the US the positive aspects of service competition are put to the test (Picot& Wernick 2007, 661-672). In 2003 the obligation to provide shared DSL access to competitors were eliminated in the same way as non-discrimination obligations and obligations to offer DSL at wholesale in 2005 as the wholesale market for DSL and cable modem Internet access services were assessed effective and to remain so even in the absence of regulation. On the other hand, one should bear in mind that platform competition may also lead to negative results if gains from the reduced deadweight loss due to higher competition are outweighed by the inefficient duplication of an existing infrastructure (Laffont& Tirole 2000). For example, in contrast to the European “ladder of investment”, whereby new entrants would seek to progressively grow their business, in the USA, the only rung that solidly remains is the unbundling of copper loops.

2. Relevant Market definition in EU framework

The new EC recommendation (EK 2007, 1-3) on relevant markets defines Market 4 (previously Market 11) as the market for wholesale (physical) network infrastructure Access (also local loop unbundling) at fixed location and market 5 as Broadband Access. The wholesale broadband access market comprises non-physical or virtual network access including “bit stream” access at fixed location. This market is situated downstream from the physical access covered by the wholesale unbundled access in that wholesale broadband access can be constructed using this inputs combined with other elements. Products or services included in both relevant markets are used as wholesale inputs to provide retail broadband access to end users at the retail level. The main purpose of market definition is to identify in a systematic way the competitive constraints that the undertaking faces. The objective is to identify those actual and potential competitors of the undertakings that are capable of constraining their behaviour and of preventing them from behaving independently. As stated in the Commission’s Guidelines and Access Notice, there are in the electronic communications sector at least two main types of relevant markets to consider, that of services or facilities provided to end-users (retail markets) and that of access to facilities for operators necessary to provide such services to end-users (wholesale markets). Within these two types of markets, further market distinctions may be made depending on demand and supply-side characteristics. Cumulative criteria are appropriate to identify which electronic communications markets are susceptible to ex ante regulation (EC 2007, 8). The first criterion is that market is subject to high and non-transitory entry barriers. The presence of high and non-transitory entry barriers, although a necessary condition, is not itself a sufficient condition to warrant inclusion of a given defined market. Given the dynamic character of electronic communications markets, possibilities for the market to tend towards a competitive outcome, in spite of high and non-transitory barriers to entry, need also to be taken into consideration. The second criteria, therefore, is that a market has characteristics such that it will not tend over time towards effective competition. The third criterion considers the insufficiency of competition law by itself to deal with the market failure (without ex ante regulation), taking account of the particular characteristics of the electronic communications sector. In the Electronic Communications sector, the geographical scope of the relevant market has traditionally been determined by reference to two main criteria (EC 2002, 165/13): the area covered by the network and the scope of application of legal and other regulatory instruments. This corresponds generally to the territory of the EU Member states concerned since the consideration centres on the scope of the potential SMP (significant market power) operator’s network and whether that potential SMP operator acts uniformly across its network area or whether it faces such different conditions of competition that its activity is constrained in some areas but not in other. However, investments in alternative infrastructure is often uneven across the territory of a Member states, and in many countries there are now competing infrastructure in parts of the country, typically in the urban areas (EC 2007, 12). European Commission identified product and services, which needs to be included in both wholesale Access relevant markets. The least replicable element in the establishment of an access

transmission channel to an end-user location is local access or the local loop. Upgraded cable systems have become more widely developed and deployed in some parts of the community. Such systems still have a limited coverage. The unbundling of cable networks at this stage does not appear technologically possible, or economically viable, so that an equivalent service to local loop unbundling cannot be provided over cable networks. Other access technologies including wireless local loop, digital broadcast systems and power-line systems are starting to become available, but only on a scale that imposes little if any constraints on the local loop operators. The reason for identifying the additional wholesale market beside local loop market was based on the view that even regulated local loop access would be insufficient in most Member States to constrain potential market power at the retail level and a significant entry barrier would still exist. These two wholesale markets can be separate on the basis of their product characteristics and by virtue of demand and supply substitution. The two relevant access markets unbundled loops and wholesale broadband access can frequently be distinguished on the basis of the flexibility they give in supplying the retail services, or by means of the location at which access is obtained. Unbundled local loops typically give greater flexibility and control over the retail broadband services offered to the end-users and have been supplied at the main distribution frame. In contrast, wholesale broadband Access in the form of bit-stream service typically gives less flexibility over the retail services, and may be supplied at higher points in the network (such as regional interconnection points), as well as at the main distribution frame (MDF). The definition also supports the principle "ladder of investment". The local loop market is situated upstream from the wholesale broadband access market and regulation on the local loop market may facilitate market entry on the wholesale broadband access market. In the view of investment required for local loop unbundling and the absolute cost advantage of the incumbent resulting from economies of density and scale, high barriers to entering the wholesale broadband access market remain even in the presence of regulated local loop unbundling. Experience indicates that the coverage of local loop unbundling in a given Member States, in combination with the existence of alternative broadband access networks such as cable, fibre, wireless, may imply that in a limited number of Member states the market for wholesale broadband access may tend towards effective competition behind the barriers to entry. This may be the case where both broadband penetration and unbundling rates are very high, and where alternative operators have started to provide wholesale broadband access services in large parts of the country in competition with the incumbent, thereby providing direct constraints on the market power of the incumbent in supplying wholesale access services. The level of competition at the retail level from both vertically integrated undertakings and exploiting unbundled local loop access may be such as to exert an indirect constraint on the market for wholesale access services. At the moment this is not the case in EU. The wholesale broadband access market covers "bitstream" access that permits the transmission of broadband data in both directions and other wholesale access provided over other infrastructure, if and when they offer facilities equivalent to bitstream access. Bitstream is a service which depends in part on the Public Telephone Network and may include other networks such as the ATM network. The question has arisen as to whether wholesale access to cable networks that provide a return path is part of the relevant market. Experience indicates that, where cable networks exist, their geographical coverage is often limited and wholesale access to such networks does not constitute a direct substitute for DSL-based access products from the demand or supply side, so that inclusion in the same product market is not justified. Wholesale product of DSL-based access product is according to the definition "bitstream" access. For existing wholesale customers, migrating from DSL-based access to cable-based access would give rise to substantial switching costs so that switching is unlikely to occur in reaction to a small but significant non-transitory price increase, known as SNIPP test (EC 2002, C165/12). Suppliers would also be in a position to price discriminate between existing wholesale customers and wholesale customers that have not yet committed to a particular technology so that existing customers would not benefit from any constraining effect of uncommitted customers. The presence of cable (or other broadband-capable networks) in a given Member States may, however, exercise an indirect constraint on the provider of DSL-based wholesale broadband access, through the substitutability between both products at the retail level. Broadband subscribers may have a choice

between the services provided by the integrated incumbent, by other vertically integrated companies (such as cable operator), or by firms using inputs supplied by the incumbent. If alternative integrated undertakings have high market shares compared to firms exploiting inputs (and the former choose not to offer wholesale inputs), it is likely that indirect constraints will be more important than direct ones. The impact of the constraints via retail level will in general be stronger the larger the demand elasticity at the retail level is, the more of a wholesale change is passed on the retail level, and the larger is the ratio of wholesale to retail price (Schwarz, 2007, 263-264). The European Commission should not veto decisions where alternative platforms are included into the market and the competitive constraints via the retail level are indeed likely to be strong enough to constrain a hypothetical monopolist test (SNIPP test) and, in the end, the DSL incumbent. If these competitive constraints are not taken into account, there remains the danger that DSL operators are regulated despite the existence of several alternative infrastructures delivering similar services (in large enough areas) at the retail level. The range of access speeds of DSL technology, which are available at the retail level are typically evolving as a function of user's demands and willingness to pay, network capabilities, and retail competition from other infrastructure. To satisfy retail demand, wholesale broadband access services over DSL technology appear to be substitutable, (subject to any constraints imposed by network capabilities or the speeds enabled by the prevailing technology), provided that any actual or perceived switching costs for end-users are not excessive. It remains open to individual NRAs to examine this issue in further detail on the basis of national circumstances.

3. Remedies imposed on SMP market players

Typically the SMP operator (operator with significant market power) is the national incumbent with the exception of the one NRA (National Regulatory Authority) that defined sub-national geographic market identifying the corresponding local incumbents as having SMP (for example "Finland"). The EU framework recommends following remedies to be imposed on SMP players to prevent independent behaviour (EC, 2002, L108/14-16): transparency, access obligation, accounting separation, non-discrimination, price control and cost accounting separation. The new framework in 2009 (EC 2009, L337/61-62) also includes the new remedy called functional separation. Among cost orientation two instruments of Access obligation are used: retail minus and cost-based. Cost based methods (ERG 2009, 41-42) uses Historical cost Accounting (HCA) and Current Cost Accounting (CCA). Models like LRIC (long run incremental costs), LRAIC (Long run Average incremental costs) and FDC (Fully Distributed costs) are used. The most intensive regulation uses LRIC (LRAIC) as a method of regulation. The less intensive regulation uses FDC method based on current or historic costs. Non cost based regulation uses mostly retail minus (define the difference between the retail and wholesale price) for wholesale regulation. Models like benchmark and price cap are mostly used for retail regulation. Other remedies are non price control methods and are much weaker. Mostly just show the intention of regulation as a threat. Deregulation or no regulation is the level, where the NRA finds the market as fully competitive or regulation has not even started.

4. Literature review and different approaches

Different remedies can be imposed to players with significant market power. Retail minus regulation avoids foreclosure and leads to better results than cost-based regulation in terms of investment level and consumer surplus. Retail minus regulation allows a higher consumer surplus than deregulation of access price as long as the regulator carefully defines the retail minus instruments (Brandao and Sarmento 2007, 236-250). The practice of the regulators in the definition of cost-based policy is to require that the entrants contribute to cover the fixed costs of providing access. Then, regulators define the mark-up to cover the fixed costs, or part of it. The concept of cost-based regulation adopted by many telecommunication regulators is the Long Run Incremental Costs (LRIC). The implementation of LRIC involves the quantification of the incremental cost of

providing access in a forward-looking perspective. With this perspective it is necessary to consider the substitution costs of the assets that will be supported in the future. This is in contrast to historic cost accounting. Several problems can be indicated, when using LRIC model. The precise quantification of LRIC raises many questions, namely concerning the allocation of common costs and the process of gathering the necessary information to compute appropriate replacement costs (Mason and Valletti 2001, 389-415). The concept of LRIC mostly does not take into the consideration neither the irreversible nature of many telecommunications investments, nor costs with the development of new services that did not succeed in the market. LRIC model adopted by some European countries discourages investment in fixed networks by the incumbent firms, because they anticipate that they will be required to offer access at cost-based prices (Cave and Prosperetti 2001, 416-431). LRIC model also has a poor performance in terms of dynamic efficiency of cost-based regulation because firms do not have the incentive to innovate if they know that they will be required to offer access to their rivals at cost-based prices. If the regulator carefully defines the margin between retail and access (wholesale) prices, with retail minus regulation it is possible to achieve better results than either with deregulation or cost-based regulation, in terms of protection of downstream competition and consumer surplus. Retail minus regulation allows greater flexibility in access price definition than cost based regulation. Under the former, the access price definition is influenced not only by the costs but also by demand characteristics and oligopoly interactions that occurs in the retail market. The incumbent firm has a higher incentive to invest in network improvements, which has positive consequences on market development. Retail minus regulation does not require that the regulator has precise information about firm's costs. This is a very important feature for regulatory instruments considering the profound difficulties that the regulators may face in gathering information about the internal characteristics of firms, in particular in new markets where there is high uncertainty about costs. Mandatory unbundling to incumbent operators can also delay facilities-based entry and reduce network investments, particularly if unbundled input prices are set too low. Excessive prices for essential network elements could hamper competitive entry. The results of statistical analysis show (Dippon and Ware 2010, 54-64) that when relevant demand and supply determinants are included in the analysis, the association between mandatory unbundling and increased penetration is not statistically significant. The dynamic nature of the sector and the costs of implementing mandatory unbundling imply that policy makers should carefully examine the costs and benefits of regulatory intervention. The costs of mandatory unbundling is particularly complex because some of the costs are indirect- for example, reduced incentives to invest may stifle innovation and network development in ways that are not immediately apparent. It is also difficult to measure the impact of mandatory unbundling on investment and innovation because many factors, including change in other forms of regulation, mergers and acquisitions, and the state of the national economy, affects those activities, and only net effects are observable at the retail market. Policy makers must consider whether unbundling requirements could distort retail market competition because some platforms are regulated while others are not. The analysis of Dippon and Ware (2010, 54-64) could also lead to wrong conclusion, while the parameter of mandatory unbundling is explained by percentage of MDFs (main distribution frames) with competitors present and not with the whole number of unbundled loops. The whole number could vary from the figures in the analyse, while there could a different number of unbundled loops at different MDFs. Almost it is impossible to come to the conclusion that regulation does not stimulate the growth. The country- specific outcomes of liberalisation in Cyprus are consistent with the general tendency in small European economies and jointly provide strong evidence that smallness affects the success of liberalisation (Symeou 2009, 215-229). The regression results show, that the effect of the number of operators on penetration rates appears to be statistically insignificant for internet services and the incumbent's market share remains unaffected by changes in the number of operators. For a large economy, intensive competition is very likely to both reduce market concentration and induce increase in service penetration. For a small economy, a loss in the incumbent's share will very probably impair its efficiency due to market size limitations, whilst expectations for a respective increase in service penetration must be reduced. Small economies maintain higher concentration levels after

competition in all technologies. The Policy makers must take into the consideration also the each technology's life cycle in its policy formation. The closer to its saturation stage the technology is, the less likely its penetration rate will be influenced by competition. The success of liberalisation is not determined by the number of alternative operators and the decline in the incumbent's market share, but by the magnitude of increase in consumer welfare as this is depicted by service affordability, accessibility, quality, and innovation. Small economies can expect to achieve comparable outcomes to large economies by allowing only a few operators in their markets. The NRA needs to ensure that the incumbent will not abuse its dominant position while giving the incumbent operator sufficient incentives to increase its efficiency. The NRA may decline entry to candidate firms on efficiency grounds. Whilst discouraging entry might promote more concentrated markets, this should not necessary disadvantage consumer welfare. Service competition as measured by incumbent market share on the regulated DSL technology shows positive sign with penetration, but not statistically significant (Höfler 2005, 12). Thus, more intense competition in the retail market for DSL does not seem to significantly increase the broadband penetration. This sheds some doubt on the effectiveness of service competition. Based on the previous conclusions also smallness affects the concentration level and service competition, while on the other hand it is difficult to increase the infrastructure competition. Because of different sizes of economies in EU countries it is difficult to expect a significant statistical correlation between service competition and penetration. On the other side density has positive effects on penetration. Based on the previous researches we can evaluate statistical model and try to answer the question what type of regulation stimulates the service competition and how different types of regulation on both relevant markets influences on the behaviour of the incumbent and competition.

5. Methodology and Model

First we have to rank different remedies from the perspective of its intensity. The Table 1 rank different possible remedies used in practice for wholesale regulation:

Table 1: ranking of remedies

Remedy	Rank
No regulation in the last years	1
Remedies except cost price control	2
Price control with the retail minus remedy	3
Cost based prices (FDC ...) except LRIC model	4
LRIC, LRAIC model	5

Both markets defined for the purpose of wholesale Broadband regulation should be analysed together, but different remedies were imposed to each of them. The wholesale regulation was imposed mostly only to incumbent player, building DSL technology to offer services to end users. So the main question is how the increasing intensity of regulation from 1 to 5 influences the share of DSL technology in different member states and also the service and infrastructure competition in EU. To answer the question we have to evaluate the regression model from data enclosed in Appendix 1. We have to find the correlation coefficient between the two variables (Rovan 2008, 6):

$$r_{yx} = \frac{c_{yx}}{s_y * s_x} \text{ and } -1 \leq r_{yx} \leq 1 \quad (1)$$

Where c is koeficient of co-variance and s is standard deviation koeficient. We insert data with normal distribution from EC Reports (2010) and from ERG Reports (2009, 35-206) into the model SPSS15 for windows and come to the following results regarding correlation coefficient and risk parameters between the intensity of regulation on both markets, market share of DSL technology, incumbent share on retail broadband market and on DSL technology :

Table 2 : Results from SPSS15 (correlation matrix)

X/Y	Regulation (bitstream)	Regulation (local loop)	Share of DSL tech.	Share of incumbent on DSL	Share of Incumbent (retail)
Regulation (bitstream) Pearson Correlation (r) Sig. (2-tailed) N	1	,635** ,000 29	,056 ,789 27	-,463* ,015 27	,433* ,024 27
Regulation (local loop) Pearson Correlation (r) Sig. (2-tailed) N	,635** ,000 29	1	,216 ,279 27	-,404* ,036 27	,116 ,563 27
Share of DSL technology Pearson Correlation (r) Sig. (2-tailed) N	,056 ,789 27	,216 ,279 27	1	-,075 ,709 27	,118 ,557 27
Share of incumbent on DSL (retail) Pearson Correlation (r) Sig. (2-tailed) N	-,463* ,015 27	,404* ,036 27	-,075 ,709 27	1	-,347 ,076 27
Share of incumbent (retail) Pearson Correlation (r) Sig. (2-tailed) N	,433* ,024 27	,116 ,563 27	,118 ,557 27	-,347 ,076 27	1

* Correlation is statistical significant

** Correlation is statistical significant (high level of correlation)

From the matrix we can predict that intensity of regulation on both markets has positive effect on the development of DSL technology, but not statistically significant with high risk of acceptance. The correlation is not statistically significant. The correlation between the market share of incumbent on the retail level and the share of DSL technology is slightly negative, but also not statistical significant. The correlation is statistical significant and positive between market share of incumbent on the retail market and the intensity of bitstream regulation. So there is evidence that intensive bitstream regulation force incumbent to invest in other technologies (not just DSL) and try to improve its market share on the retail level. The impact of the intensity of regulation on both markets has negative influence on the market share of incumbent on the DSL technology. The intensive regulation increases the service competition and service competition also increases penetration (Höfler 2005, 12).

Additionally we can evaluate the linear regression model (method ENTER) between two types of regulation, which are strongly correlated. The average regulation based on local loop unbundling is stronger and it counts on the level of 3,45, while the level of bitstream regulation is 2,72. Also the

standard deviation in case of local loop unbundling is higher. The regression model between the two types shows following results:

Table 3 : Regression ENTER model

Model	Unstandardized Beta	Std. Error	Standardized Beta	T	α
Constant	1,501	,506		2,964	,006
Intensity of regulation (bitstream)	,715	,168	,635	4,266	,000

a. Dependent variable: Intensity of regulation (local loop unbundling)

The correlation is very strong. If the intensity of bitstream regulation is increased by 1, the intensity of local loop unbundling is also increased by 0, 635. So the regulation is either strong on both segment or weak on both segments. We can assume that principle of the ladder of investment regulation is not completely fulfilled or the observed EU countries are not at the stage where the regulation started to go down the ladder even the fact that market is somewhere close to saturation and only higher access speeds will be offer in the future.

6. Conclusion

The model shows no statistical evidence that intensity of regulation influence the development of DSL technology. From this point it is difficult to confirm, that intensive regulation increases competition based on wholesale products. Anyway there is slight evidence, that regulation improves the benefits of regulated technology. We can see from the correlation matrix that correlation between regulation of bitstream and local loop unbundling is strongly correlated and positive. So at the moment it is no evidence of complete validation of the ladder of investment regulation in EU, despite the fact that regulation on local loop unbundling is more intensive than bitstream regulation. The correlation between level of regulation on two markets should be statistical significant, but probably negative. According to the principle of ladder of investment regulation, operators should have started to build its own network after increase its business through wholesale regulation. The results also show, that incumbent tries to invest in new networks based on strong wholesale bitstream regulation. Strong local loop regulation does not force the incumbent to invest in other broadband technologies or at least the correlation is not statistically significant. The bitstream regulation forces the incumbent to improve its retail market position by investing in other technologies. It has definitely stronger influence on the market development than local loop unbundling regulation. This statement is also confirmed by the fact that local loop regulation is more intensive at the average, but has less influence on market characteristics. It has less influence on service competition and also on the market share of the incumbent on retail market. The intensity of local loop unbundling regulation has more influence only on the development of DSL technology compared to others Access technologies. It improves the value of DSL technology more than bitstream regulation. More the intensity of regulation goes down the ladder of investment highest is the market share of DSL technology. Anyway Broadband regulation should be based mostly on bitstream regulation, which is strongly recommended for small countries, where the concentration is very high and carries are not highly interested to invest in its own Access network. Regulators should basically focus on local loop unbundling regulation after the precise market analyse and the fact, that the results from bitstream regulation are proven on the market outcomes. Regulation must have positive effect on infrastructure competition in dependence from size of the economy. The results of this analyse proves that with the increasing intensity of regulation incumbent market share started to decline on the regulated technology and increase on other non regulated technologies. The intensity of regulation has a positive effect on the development of the regulation technology, despite the fact that the statistical correlation is not

significant. Increased intensity of regulation increases service competition and forces the incumbent to be more active in infrastructure competition on the market. It is crucial to define the limits between regulation and deregulation. It is important to define the point when the service and infrastructure competition on the vertically correlated retail market are high enough to prevent independent behaviour on the wholesale level, taking into the consideration also the level of market saturation. This should be the basis for further researches.

Literature

- [1] A. Brandao and P. Sarmento, Access pricing: A comparison between full deregulation and two alternative instruments of access price regulation, cost based and retail minus. Telecommunications Policy 31: 236-250, 2007.
- [2] M. Cave and L. Prosperetti, European telecommunications infrastructure. Oxford Review of Economic Policy 17: 416-431, 2001.
- [3] C.H. Dippon and H. Ware, Wholesale unbundling and intermodal competition: Telecommunications Policy 34: 54-64, 2010.
- [4] EC, Directive 2002/21/EC of the European Parliament and of the council of 7 March 2002 on a common regulatory framework for electronic communications networks and services (Framework Directive): Official Journal L108, 2002. Available: http://ec.europa.eu/information_society/policy/ecomm/library/legislation/index_en.htm.
- [5] EC, Directive 2009/140/EC of the European Parliament and of the Council of 25 November 2009 amending Directives 2002/21/EC on a common regulatory framework for electronic communications networks and services, 2002/19/EC on access to, and interconnection of, electronic communications networks and associated facilities, and 2002/20/EC on the authorisation of electronic communications networks and services (Text with EEA relevance): Official Journal L337, 2009. Available: http://ec.europa.eu/information_society/policy/ecomm/library/legislation/index_en.htm.
- [6] EC, Commission guidelines on market analyses and the assessment of significant market power under the Community regulatory framework for electronic communications networks and services (2002/C 165/03): Official Journal C165, 2002. Available: http://ec.europa.eu/information_society/policy/ecomm/library/legislation/index_en.htm.
- [7] EC, Explanatory note to the Commission recommendation On Relevant Product and Service Markets within the electronic communications sector susceptible to ex ante regulation in accordance with Directive 2002/21/EC of the European Parliament and of the Council on a common regulatory framework for electronic communication networks and services: Commission of the European Communities, 2007. Available: http://ec.europa.eu/information_society/policy/ecomm/library/recomm_guidelines/index_en.htm
- [8] EC, Progress report on the single European Electronic Communications Market 2009 (15TH Report) SEC(2010) 630, 2010. Available: http://ec.europa.eu/information_society/policy/ecomm/doc/implementation_enforcement/annualreports/15threport/comm_en.pdf
- [9] ERG, ERG Report: Regulatory Accounting in Practice 2009 ERG (09) 41: 1-41, 2009. Available: http://www.erg.eu.int/doc/publications/2009/erg_09_41_regulatory_accounting_report_in_practice_2009_final.pdf
- [10] ERG, Report on Next Generation Access – Economic Analysis and Regulatory Principles ERG (09) 17, 2009. Available: http://www.erg.eu.int/documents/erg/index_en.htm
- [11] F. Höfler, Cost and Benefits from infrastructure competition. Estimating Welfare Effects from Broadband Access Competition: Max Planck Institute: 1-23, 2005.
- [12] J. J. Laffont and J. Tirole, Competition in Telecommunications. London: The MIT Press, 2000.

- [13] R. Mason and T.M. Valetti, Competition in communications networks: Pricing and regulation. Oxford Review of Economic Policy 17: 389-415, 2001.
- [14] C. S. Pavlos, Does smallness affect the liberalisation of telecommunications? Case of Cyprus: Telecommunications Policy 33: 215-229, 2009.
- [15] A. Picot and C. Wernick, The role of government in broadband Access: Telecommunications Policy 31: 660-674, 2007.
- [16] J. Rován, Vodnik po predavanjih statistika 2, Ekonomska Fakulteta Univerze v Ljubljani: 1-12, 2008. Available: http://miha.ef.unilj.si/_dokumenti3plus2/191142/st2_06_analiza_odvisnosti_2008_nov.pdf
- [17] A. Schwarz, Wholesale market definition in telecommunications: The issue of wholesale broadband access. Telecommunications Policy 31: 251-264, 2007.

UTICAJ REGULACIJE ŠIROKOPOJASNOG SPEKTRA U EU NA RAZVOJ REGULISANE TEHNOLOGIJE

Andrej Mihevc

Appendix 1

	Country	Intensity/LLU	Intensity/BS	DSL Share	Incumbent DSL share	Incumbent retail share
1	Austria	5	3	0,68	0,75	0,51
2	Belgium	5	5	0,57	0,86	0,49
3	Czech Rep.	1	1	0,39	0,87	0,34
4	Denmark	5	5	0,6	0,73	0,63
5	Estonia	4	3	0,42	0,94	0,52
6	France	4	4	0,95	0,48	0,46
7	Germany	2	2	0,9	0,51	0,46
8	Greece	5	3	100	0,56	0,55
9	Hungary	5	2	0,44	0,77	0,41
10	Ireland	5	3	0,72	0,69	0,51
11	Italy	4	4	0,97	0,59	0,57
12	Lithuania	4	1	0,36	0,99	0,49
13	Netherlands	4	4	0,62	0,74	0,48
14	Norway	4	2			
15	Poland	1	1	0,56	0,72	0,4
16	Portugal	3	4	0,59	0,73	0,44
17	Romania	3	1	0,28	100	0,28
18	Slovak Rep.	1	1	0,46	0,92	0,44
19	Slovenia	5	4	0,62	0,66	0,46
20	Spain	3	4	0,8	0,68	0,55
21	Sweden	5	3	0,59	0,61	0,39
22	Switzerland	5	5			
23	UK	5	2	0,79	0,36	0,28
24	Finland	3	2	0,76	0,68	0,67
25	Luxemburg	2	3	0,83	0,8	0,67
26	Malta	2	2	0,48	0,94	0,45
27	Cyprus	3	3	0,94	0,83	0,78
28	Bulgaria	1	1	0,31	100	0,31
29	Latvia	1	1	0,49	100	0,52